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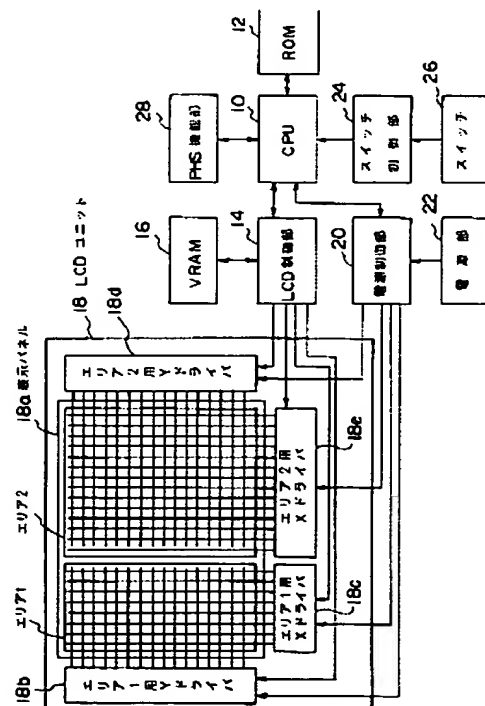
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(54) 【発明の名称】 情報機器

(57) 【要約】

【課題】表示すべき情報量に応じて表示制御することで低消費電力化を図ることを可能にする。

【解決手段】複数の表示エリア1、2が設けられ、各表示エリア1、2を個別に表示駆動するLCDユニット18と、LCDユニット18の各表示エリア1、2に対する表示駆動を制御するLCD制御部14と、LCDユニット18の各表示エリア1、2に対する表示駆動のための電力を、各表示エリア毎に供給する電源制御部20と、LCD制御部14及び電源制御部20を、LCDユニット18の特定の表示エリアの表示が停止されるように制御するCPU10とを具備し、特定の表示エリアの表示を停止することで低消費電力化を図る。



【特許請求の範囲】

【請求項1】 複数の表示エリアが設けられ、各表示エリアを個別に表示駆動する表示ユニットと、

前記表示ユニットの各表示エリアに対する表示駆動を制御する表示制御手段と、

前記表示ユニットの各表示エリアに対する表示駆動のための電力を、各表示エリア毎に供給する電源制御手段と、

前記表示制御手段及び前記電源制御手段を、前記表示ユニットの特定の表示エリアの表示が停止されるように制御する制御手段とを具備し、

特定の表示エリアの表示を停止することで低消費電力化を図ることを特徴とする情報機器。

【請求項2】 前記表示ユニットの特定の表示エリアの表示が不要であることを通知するための切り替え指示手段を具備し、

前記制御手段は、前記切り替え指示手段からの通知に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする請求項1記載の情報機器。

【請求項3】 前記表示ユニットの表示エリアの面上を覆う閉状態から開放する開状態まで回動自在となるように設けられたカバーを具備し、

前記制御手段は、前記カバーの開閉状態に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする請求項1記載の情報機器。

【請求項4】 電力を供給するための電源手段を具備し、

前記電源制御手段は、前記電源手段から供給可能な電力を検出する残量検出機能を有し、

前記制御手段は、前記電源制御手段の前記残量検出機能による検出結果に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする請求項1記載の情報機器。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、LCD（液晶ディスプレイ）等の表示装置を有する情報機器に関する。

【0002】

【従来の技術】一般に携帯型の情報機器においては、表示装置としてLCD（液晶ディスプレイ）が設けられたものが多い、通常、表示装置における情報表示方法は、1つのシステムに対し1つのLCDを装備し、電源オン時にはLCD表示画面に情報を表示している。従来のドットマトリクス方式のLCDでは、1つのLCDユニットに対してX軸方向、Y軸方向でそれぞれ表示用電極を駆動するための1系統のドライバが設けられている、電源オン時には各軸方向用のドライバに対して電力が供給され、LCD表示画面全体が表示駆動の対象となる。

【0003】ところで、携帯型の情報機器では、電池駆動により長時間使用できることが要求される。このた

め、表示装置における表示は、必要最低限に抑えて消費電力を低減させることが好ましい。

【0004】しかし、携帯型の情報機器に設けられた機能によっては、常時、ある情報を提示しておく必要があり、この場合、情報をLCD表示画面において表示させようとすると、常に表示画面全体を表示駆動しなければならない。例えば、情報機器に電池残量を通知する機能を設けた場合、常時、電池残量を示す情報を提示しておく必要があるため、この情報をLCD表示画面において表示させようとすると、LCD画面を常時、表示駆動することになる。

【0005】

【発明が解決しようとする課題】このように従来の情報機器においては、LCD表示画面において何等かの情報を常時表示するためには、LCD表示画面全体を常時、表示駆動しなければならなかった、このため、多くの電力を消費することになり、電池駆動により駆動可能な時間が短くなってしまう。

【0006】本発明は前記のような事情を考慮してなされたもので、表示すべき情報量に応じて表示制御することで低消費電力化を図ることが可能な情報機器を提供することを目的とする。

【0007】

【課題を解決するための手段】本発明は、複数の表示エリアが設けられ、各表示エリアを個別に表示駆動する表示ユニットと、前記表示ユニットの各表示エリアに対する表示駆動を制御する表示制御手段と、前記表示ユニットの各表示エリアに対する表示駆動のための電力を、各表示エリア毎に供給する電源制御手段と、前記表示制御手段及び前記電源制御手段を、前記表示ユニットの特定の表示エリアの表示が停止されるように制御する制御手段とを具備し、特定の表示エリアの表示を停止することで低消費電力化を図ることを特徴とする。

【0008】また、前記表示ユニットの特定の表示エリアの表示が不要であることを通知するための切り替え指示手段を具備し、前記制御手段は、前記切り替え指示手段からの通知に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする。

【0009】また、前記表示ユニットの表示エリアの面上を覆う閉状態から開放する開状態まで回動自在となるように設けられたカバーを具備し、前記制御手段は、前記カバーの開閉状態に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする。

【0010】また、電力を供給するための電源手段を具備し、前記電源制御手段は、前記電源手段から供給可能な電力を検出する残量検出機能を有し、前記制御手段は、前記電源制御手段の前記残量検出機能による検出結果に応じて、前記表示制御手段及び前記電源制御手段を制御することを特徴とする。

【0011】このような構成によれば、複数の表示エリ

アを個別に駆動できるようにすることで、表示すべき情報量に応じて、選択的に特定の表示エリアにおける表示を停止させることができる。従って、表示駆動する表示エリアが少なくなることで、その分、消費電力が低減される。

【0012】また、切り替え指示手段（スイッチ）を設けることで、特定の表示エリアに対する表示駆動の停止を明示的に指示することができ、消費電力の低減を意図的に行なうことができる。

【0013】また、表示エリアを覆うカバーの開閉状態に応じて、すなわちカバーで表示エリアの面上を覆うことで、対応する表示エリアにおける表示が不要であることが通知される場合には、運動して特定の表示エリアの表示駆動を停止させる表示制御を行なうことで、特定の表示エリアの表示を停止させるための明示的な操作が不要となる。

【0014】また、情報機器を動作させるための電力を供給する電源手段（電池）に電池残量が少なくなった場合には、特定の表示エリアでの表示を停止させ、低電力消費化を図ることで、ある程度の表示、及び機能の実行可能な時間を延長させることができる。

【0015】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態について説明する。図1は本実施形態に係わる情報機器の構成を示すブロック図である。図1に示すように、本実施形態の情報機器は、CPU10、ROM12、LCD制御部14、VRAM16、LCDユニット18、電源制御部20、電源部22、スイッチ制御部24、スイッチ26、及びPHS（personal handy phone system）機能部28が設けられている。

【0016】CPU10は、情報機器全体の制御を司るもので、ROM12に格納されたプログラムに従う処理を実行する。ROM12は、CPU10の動作を規定するプログラムの他、各種データ等を格納するためのものである。ROM12に格納されるプログラムには、スイッチ制御部24から通知されるスイッチ26の状態に応じたLCD制御部14及び電源制御部20に対する制御（SWプログラム）や、PHS機能部28を用いたデータ通信等の制御のためのプログラムが含まれている。

【0017】LCD制御部14は、CPU10の制御のもとで、LCDユニット18における情報表示の制御を行なう。LCD制御部14は、LCDユニット18のドライバ（後述する）を、VRAM16に格納された表示データに応じて駆動して情報を表示させる。また、LCD制御部14は、CPU10からの通知に応じて選択的にドライバを駆動させて（オン、オフ）、表示画面の特定のエリアについてのみ情報を表示させることができる。

【0018】VRAM16は、LCDユニット18に表示すべき表示データを格納するもので、LCD制御部1

4によって制御される。LCDユニット18は、電源制御部20の制御により電力供給を受けて、LCD制御部14の制御のもとで情報表示を行なうもので、表示パネル18a、エリア1用Yドライバ18b、エリア1用Xドライバ18c、エリア2用Yドライバ18d、及びエリア2用Xドライバ18eが設けられている。表示パネル18aは、表示エリアがエリア1、2の2つに分割されており、それぞれに対応して設けられたドライバによって独立して表示駆動される。エリア1は、エリア1用Yドライバ18b及びエリア1用Xドライバ18cによって表示駆動され、エリア2は、エリア2用Yドライバ18d及びエリア2用Xドライバ18eによって表示駆動される。

【0019】電源制御部20は、LCDユニット18を含む情報機器を構成する各部に対して、電源部22からの電力を供給するものである。電源制御部20は、電源部22に蓄積されている電力量（電池残量）を監視する電池残量検出機能を有し、予め設定された所定の電圧値に電圧が低下した場合にCPU10に通知すると共に、LCDユニット18の所定のドライバに対する電力供給を制御する。

【0020】電源部22は、LCDユニット18を含む情報機器を構成する各部に対して供給すべき電力を蓄積する電池である。スイッチ制御部24は、スイッチ26の状態（オン、オフ）を監視するもので、スイッチ26が切替えられた際、すなわち表示パネル18aのエリア2に対する表示が不要である場合に、その旨をCPU10に通知する。

【0021】スイッチ26は、表示パネル18aのエリア2の表示が不要である状態を検出するためのもので、本実施形態では表示画面のエリア2を覆うLCDカバー32が閉じられた際に切り替えられるものである。スイッチ26の状態は、スイッチ制御部24によって監視されており、CPU10に通知される。

【0022】PHS機能部28は、パーソナルハンディホンシステム（PHS）の規格に基づいて、無線通信を行なう機能である。PHS機能部28は、無線通信を介して送受されるデータや、基地局との間の電界強度をCPU10に通知する。

【0023】次に、本実施形態における動作について説明する。本実施形態における情報機器では、PHS機能部28により無線通信を行なう基地局との間の電界強度を表示するための機能、及び電源部22に蓄積された電池残量を表示するための機能が設けられている。

【0024】電界強度表示と電池残量表示は、例えば図2に示すようにLCDユニット18の表示パネル18aに設けられたエリア1において行なわれる。CPU10は、電源制御部20から通知される、電池残量検出機能によって検出された電源部22の電圧値を示すデータに応じて、LCD制御部14に対して電池残量を表わす表

示データをVRAM16に格納すると共に、表示パネル18aにおいて表示させる。また、CPU10は、PHS機能部28から通知される基地局との間の電界強度を示すデータに応じて、LCD制御部14に対して電界強度を表わす表示データをVRAM16に格納させると共に、表示パネル18aにおいて表示させる。

【0025】LCD制御部14は、CPU10からの通知に応じて、表示パネル18aの各エリア1、2を表示駆動するために各ドライバ18b〜18eを制御する。エリア1については常時（あるいはPHS機能部28を待ち受け状態にしている時）、表示する必要があるため、LCD制御部14は、VRAM16に格納された表示データ（電池残量を示す表示データ、電界強度を表わす表示データ）に応じて、エリア1用Yドライバ18b、エリア1用Xドライバ18cを駆動させる。

【0026】また、情報機器における一般の機能を実行する場合、LCD制御部14は、エリア2用Yドライバ18d、エリア2用Xドライバ18eを駆動させて、エリア2において所定の表示を行なわせる。

【0027】電源制御部20は、LCD制御部14によって駆動制御される各ドライバに対して電力を供給する。一方、情報機器における一般の機能を使用しない場合には、例えば図3に示すようにして機器本体に設けられたLCDカバー32が、表示パネル18aの表示画面上を覆うようにして閉じられる。LCDカバー32は、情報機器本体の上面端部を支点として、機器本体の上面に設けられた表示パネル18aと平行に対面する位置（閉状態）から、表示パネル18aの面と所定の角度をもった位置（開状態）まで回動自在となるように取り付けられている。

【0028】LCDカバー32は、表示パネル18aと平行に対向する位置にある時、すなわち表示パネル18aの表示画面上を覆うようにして閉じられ時、表示パネル18aの一部であるエリア2のみが覆われるようになっている。この状態において、LCDカバー32は、機器本体の上面に設けられたスイッチ26の状態を切り替える。スイッチ制御部24は、スイッチ26の状態が切り替えられたことを検出してCPU10に通知する。

【0029】CPU10は、スイッチ制御部24からの通知に応じて、エリア2に対する表示駆動を停止、すなわちエリア2用Yドライバ18d、エリア2用Xドライバ18eによる駆動を停止させる。またCPU10は、電源制御部20に対して、エリア2用Yドライバ18d、エリア2用Xドライバ18eに対する電力供給の停止を指示する。

【0030】つまり、エリア2の表示が不要であることを検出し、その場合には表示が必要なエリア1の表示のみを継続して行ない、エリア2については表示を停止する。従って、エリア2に対する表示を停止することで電力消費を低減することができる。

【0031】また、LCDカバー32の開閉と連動してエリア2に対する表示駆動の切り替えが行なわれるので、操作性が向上される。以上の説明では、PHS機能部28を通信の待ち受け状態にし、一般の情報機器の機能を用いない時など、エリア2の表示が必要ない場合に意図的に（LCDカバー32を閉じるなどにより）表示切り替えをしているが、電源部22の電池残量に応じて自動的に表示切り替えを行なうことができる。

【0032】電源制御部20は、電池残量検出機能により電源部22における電池残量を、例えば所定の設定電圧値と比較することにより監視している。電源制御部20は、電圧値が設定電圧値まで低下したことを検出するとCPU10に通知する。

【0033】なお、設定電圧値は、例えばエリア1、2の全面駆動はできないが、表示エリアの一部分であれば駆動できるような電池残量を検出できる値、あるいは若干の時間であれば機能を実行できる電池残量を残す値とする。

【0034】CPU10は、ROM12に格納されたSWプログラムに従い、現在実行中の機能（プログラム）を正常に終了させると共に、電源制御部20からの通知に応じてLCD制御部14に対してエリア2の表示駆動を停止させる。また電源制御部20は、エリア2用Yドライバ18d、エリア2用Xドライバ18eに対する電力供給を停止する。

【0035】これにより、エリア1において、ある程度の情報の表示を継続させることができる。なお、エリア1に対する表示駆動を停止させるのではなく、エリア1の表示を停止させ、エリア2に対する表示駆動を継続させて、情報機器の一般機能を実行させるようにしても良い。

【0036】なお、前述した実施形態においては、情報機器に表示装置としてLCDユニット18が設けられているものとして説明しているが、他の表示用ユニットを用いた情報機器であっても同様な表示駆動方法を用いることができる。

【0037】また、スイッチ26は、LCDカバー26が閉じられることによって状態が切り替えられるものとして説明したが、例えば手動により切り替えるなど、どのような手段によって状態が切り替えられても良い。また、機械的スイッチではなく、CPU10によって実行されるプログラムによって、LCD制御部14によるエリア2に対する表示駆動を切り替えるようにしても良い。

【0038】また、前述した実施形態では、エリア1を常時表示すべき情報用（電界強度表示、電池残量表示）に用いているが、通常、エリア1とエリア2を合わせた表示パネル18aの全面を、情報機器の機能を実行する際の表示に用い、必要に応じてエリア1のみに特定の情報を表示するようにしても良い。

【0039】また、前述した実施形態では、表示パネル18aを2つのエリア1、2に分割し、選択的にエリア2の表示を停止させるものとして説明しているが、エリアの数は2つに限定されるものではない。すなわち、3つ以上のエリアを設けて、それぞれのエリアに対応するXドライバ、Yドライバを設け、各エリア毎に表示駆動制御、電力供給制御を行なうようにすることもできる。

【0040】また、LCDカバー32は、エリア2のみが覆われる形状としているが、表示パネル18aの全面を覆う形状とし、エリア1に対応する一部分のみが表示エリアを透過して視認できるようにしても良い。さらに、前述した実施形態におけるエリア1に表示される情報は、勿論、限定されるものではない。

【0041】

【発明の効果】以上詳述したように本発明によれば、表示エリアを複数に分割し、各エリアを必要に応じて選択的に表示駆動できるので、表示すべき情報量に応じて表示制御することで低消費電力化を図ることが可能となるものである。

【図面の簡単な説明】

【図1】本発明の実施形態に係わる情報機器の構成を示

すブロック図。

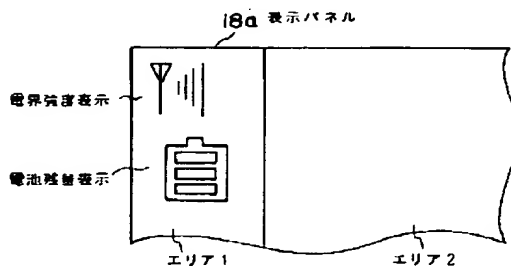
【図2】本実施形態における表示パネル18aのエリア1での表示例を示す図

【図3】本実施形態における情報機器の外観構成の一例を示す図。

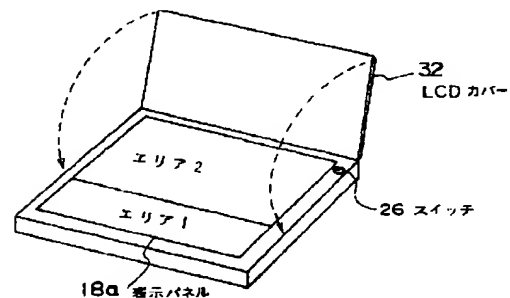
【符号の説明】

- 10…CPU（制御手段）
- 12…ROM
- 14…LCD制御部（表示制御手段）
- 16…VRAM
- 18…LCDユニット
- 18a…表示パネル
- 18b…エリア1用Yドライバ
- 18c…エリア1用Xドライバ
- 18d…エリア2用Yドライバ
- 18e…エリア2用Xドライバ
- 20…電源制御部（電源制御手段）
- 22…電源部
- 24…スイッチ制御部
- 26…スイッチ（切り替え指示手段）
- 28…PHS機能部

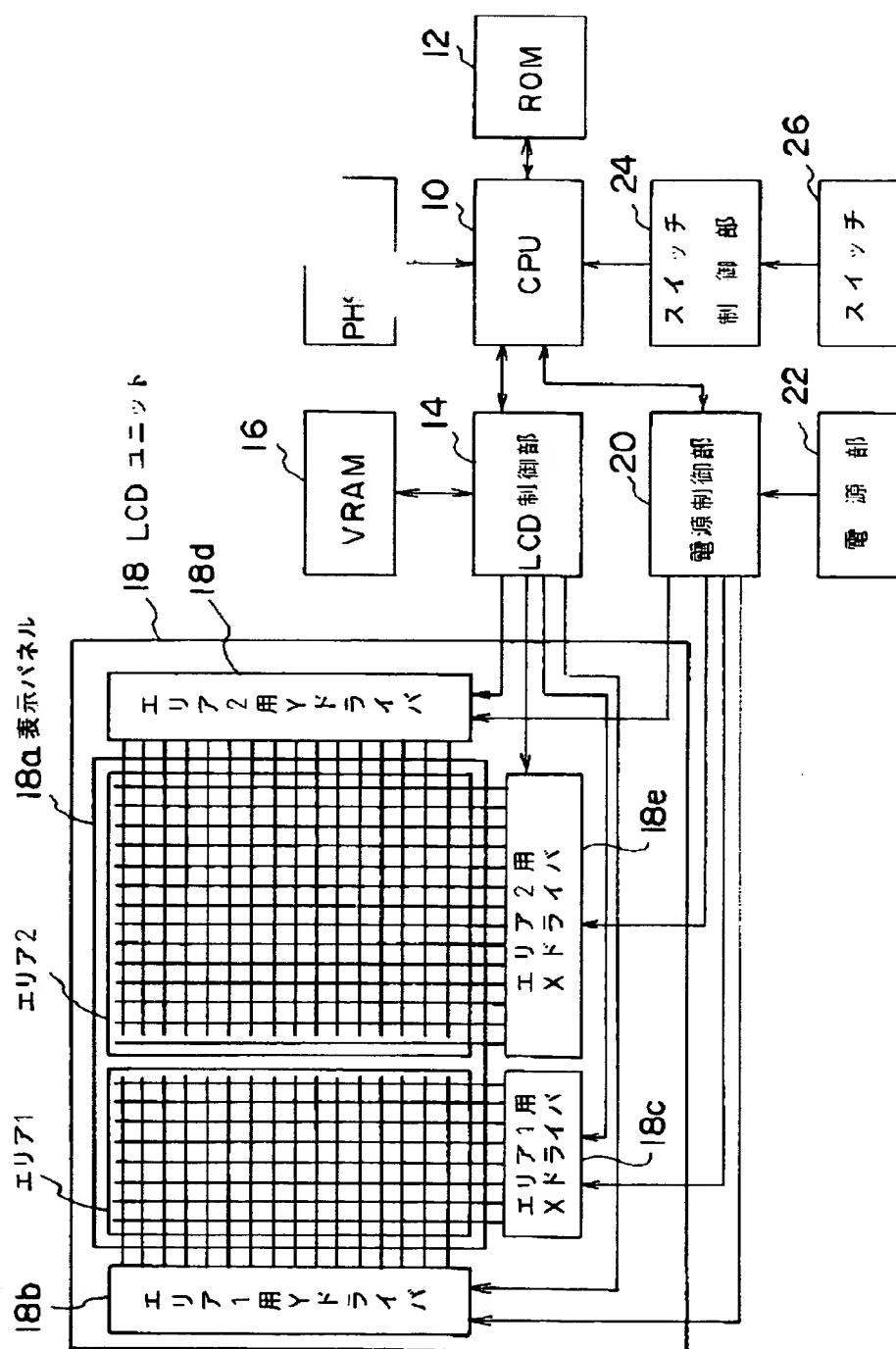
【図2】



【図3】



【図1】



フロントページの続き

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社内



US005881299A

United States Patent [19]

Nomura et al.

[11] **Patent Number:** 5,881,299[45] **Date of Patent:** Mar. 9, 1999

[54] **SELECTIVELY REMOVING POWER FROM
MULTIPLE DISPLAY AREAS OF A DISPLAY
UNIT**

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[30] **Foreign Application Priority Data**

Nov. 22, 1995 [JP] Japan 7-304202

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[52] **U.S. Cl.** 395/750.06; 395/750.03;
345/103; 345/212

[58] **Field of Search** 345/103, 212,
345/1, 115, 116, 213; 395/750.01, 750.03,
750.04, 750.06

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Primary Examiner—Meng-Ai T. An

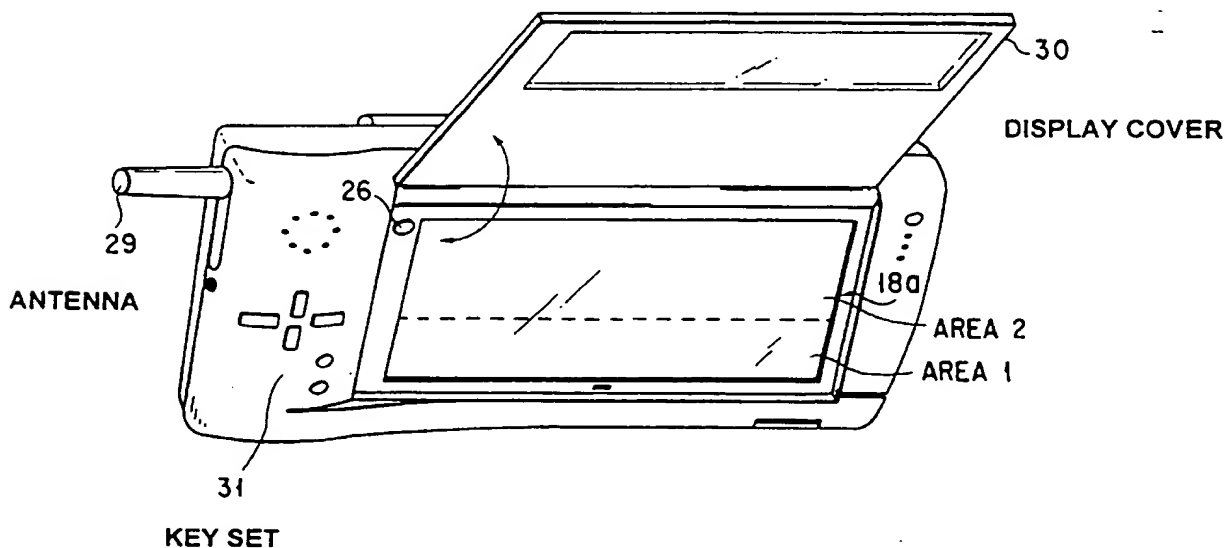
Assistant Examiner—Sumati Lefkowitz

Attorney, Agent, or Firm—Finnegan, Henderson, Farabow,
Garrett & Dunner, L.L.P.

[57] **ABSTRACT**

On one display panel, first and second display areas are provided. To display information on each area, an X-driver, a Y-driver, and an LCD controller are provided in each of the display areas. If a display cover is overlaid on the display panel, a predetermined switch is turned on. A CPU sends an instruction to a power supply controller in accordance with the ON-state of the switch. The power supply controller stops power supply to the X- and Y-drivers, and the LCD controller used in said first display area to save power by supplying power to drivers and controllers of a display area that is not covered.

15 Claims, 9 Drawing Sheets



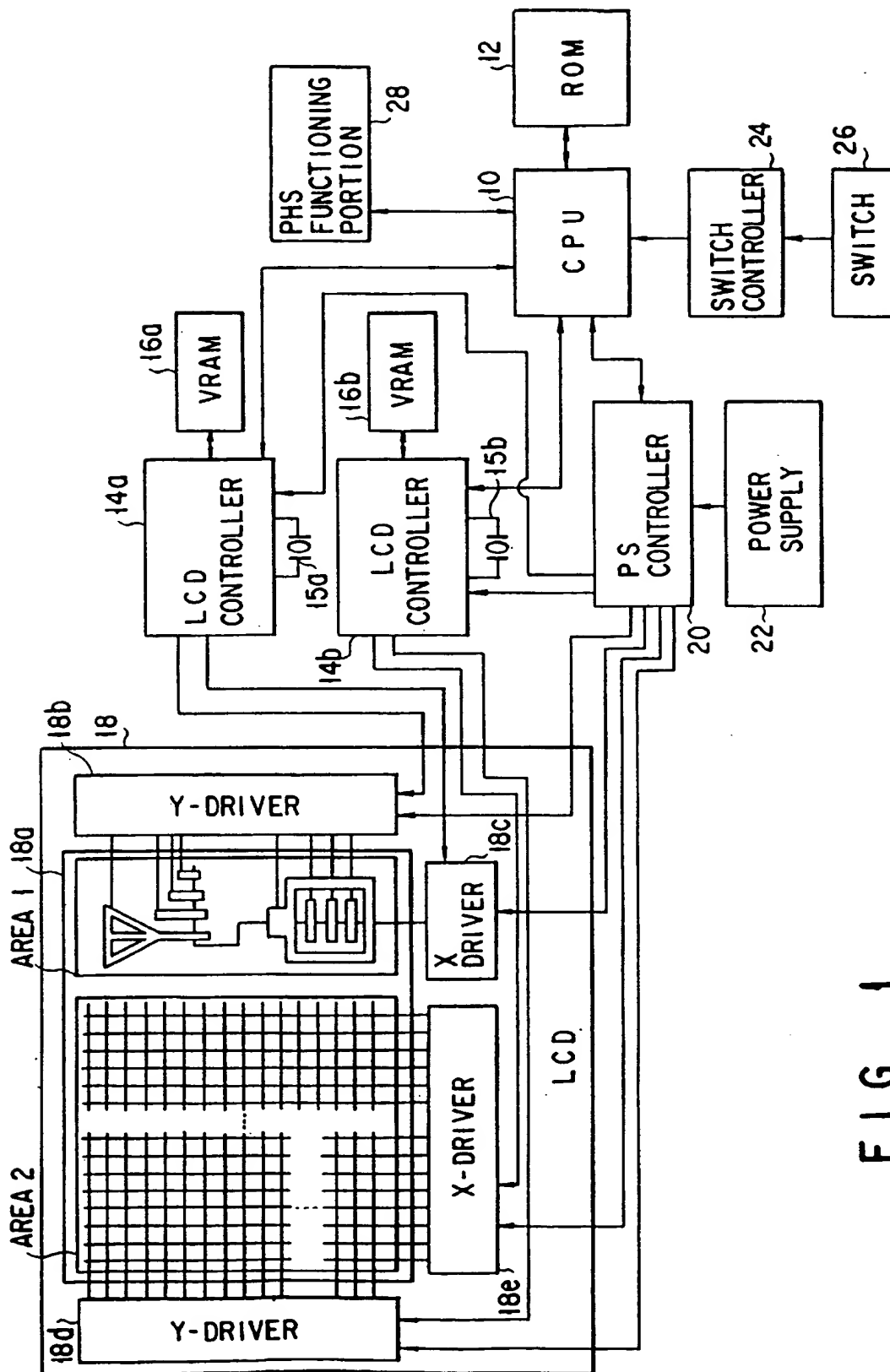


FIG. 1

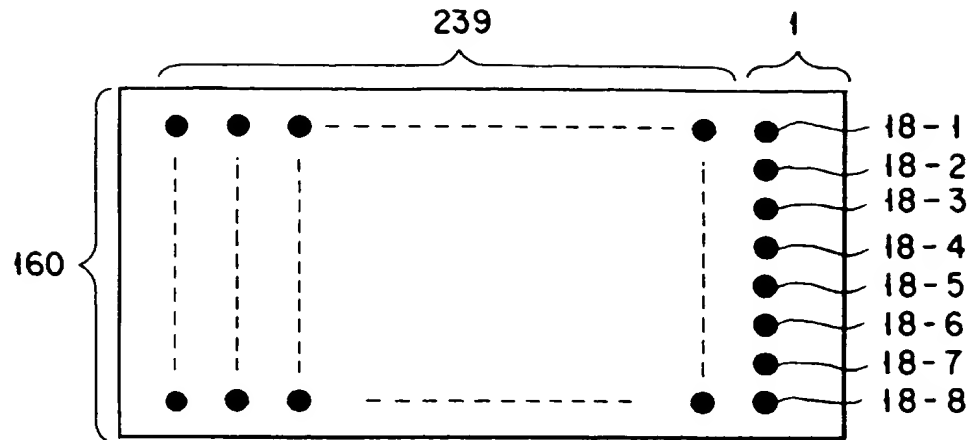


FIG. 2A

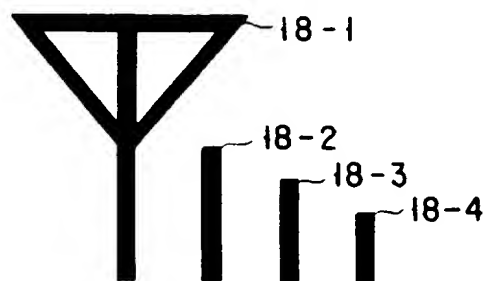


FIG. 2B

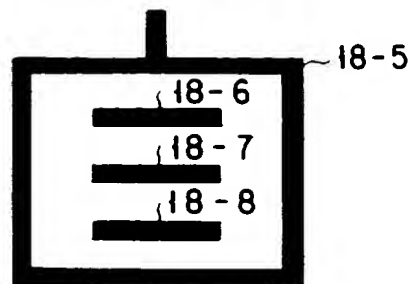


FIG. 2C

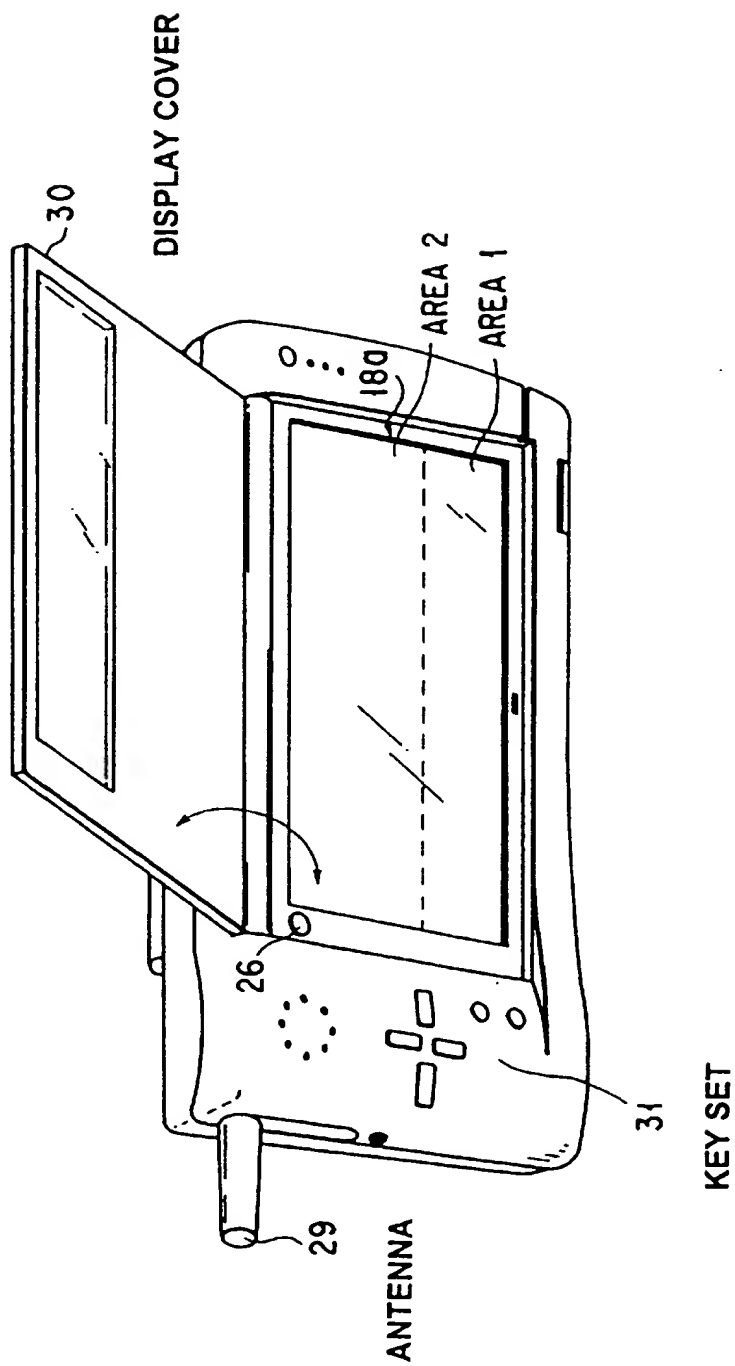


FIG. 3

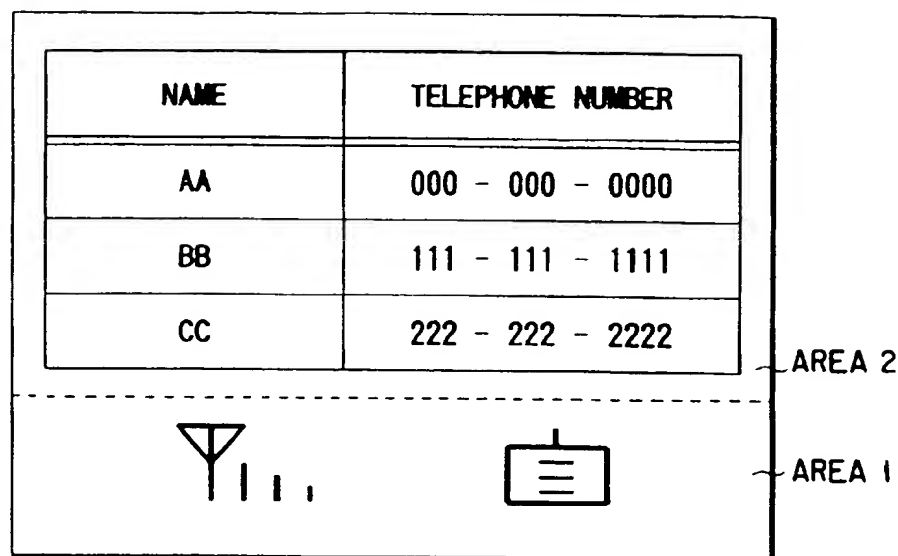


FIG. 4

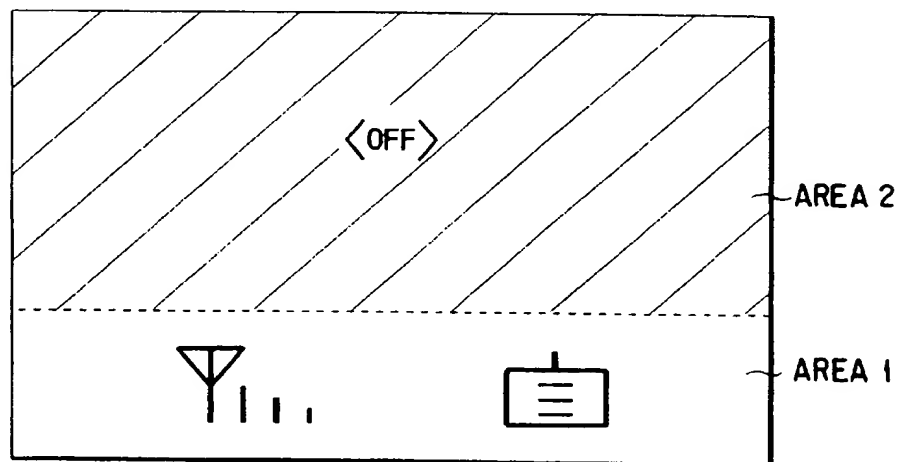
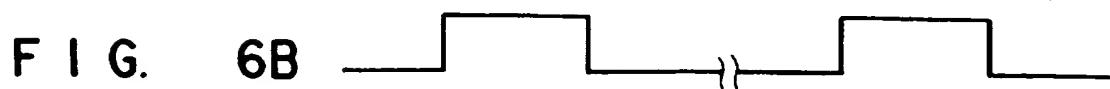


FIG. 5



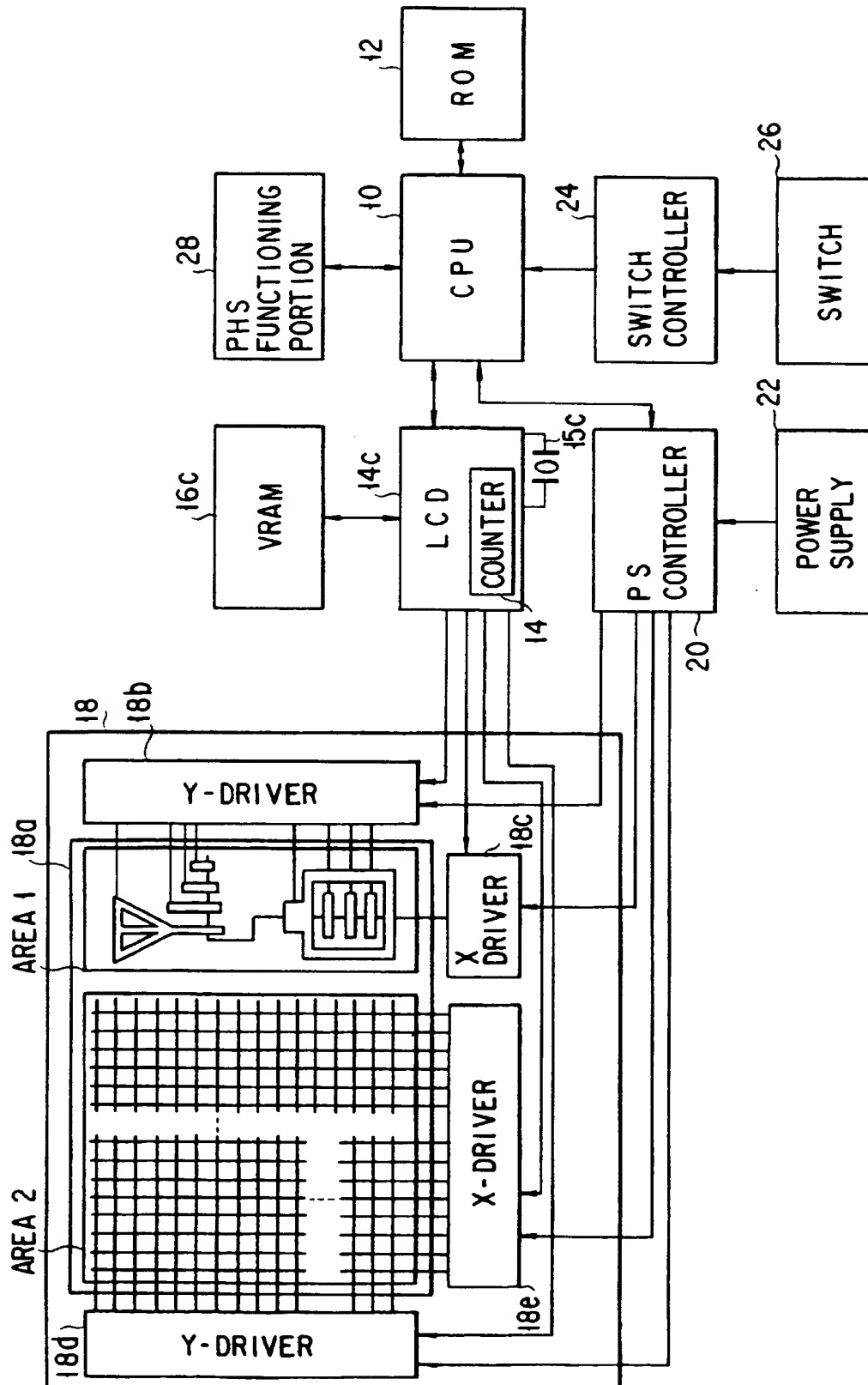


FIG. 7

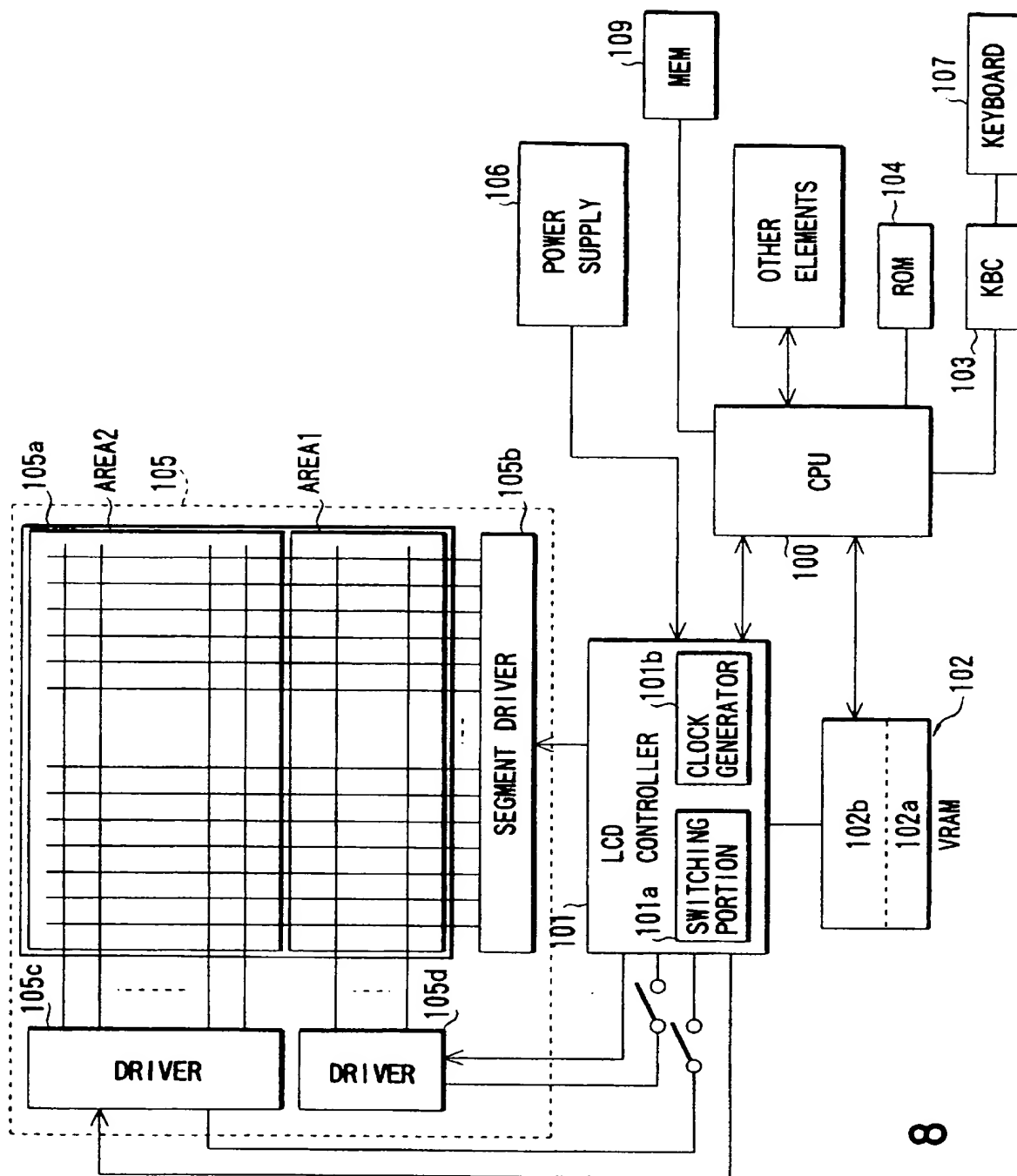


FIG. 8

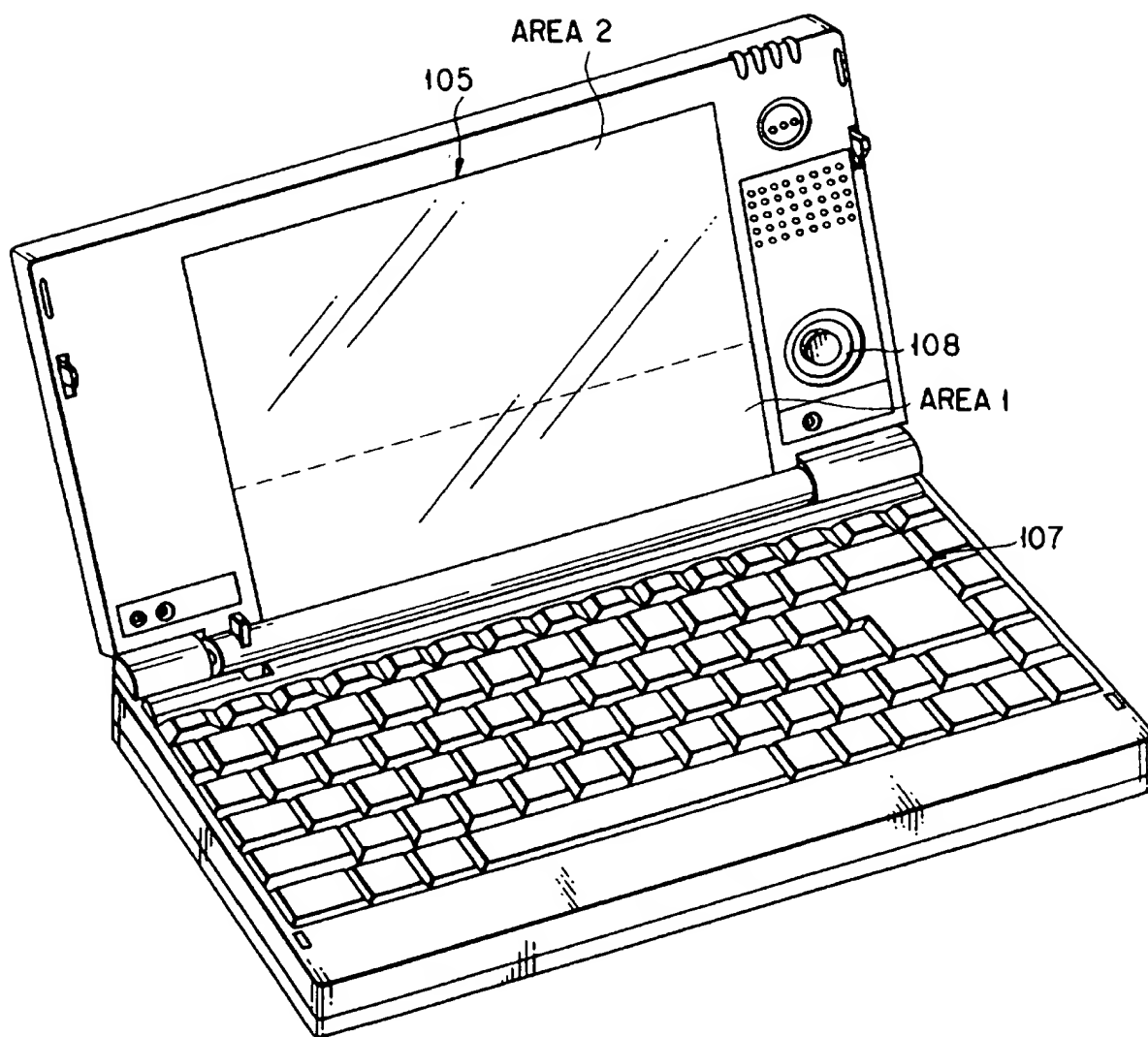


FIG. 9

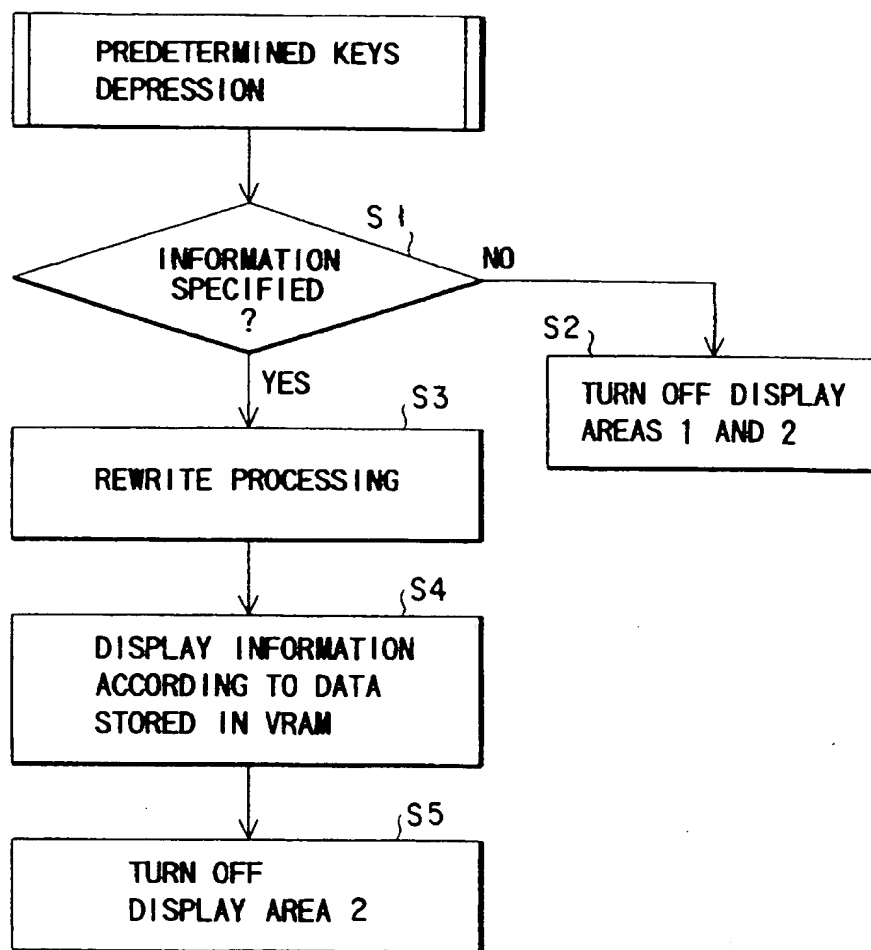
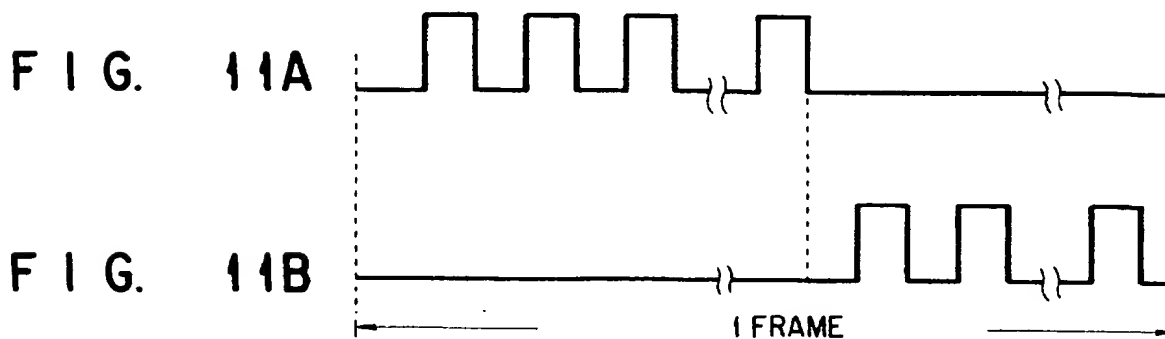


FIG. 10



NAME	TELEPHONE NUMBER
AAA	000 - 000 - 0000
BBB	111 - 111 - 1111
CCC	222 - 222 - 2222
DDD	333 - 333 - 3333
EEE	444 - 444 - 4444

105a

FIG. 12

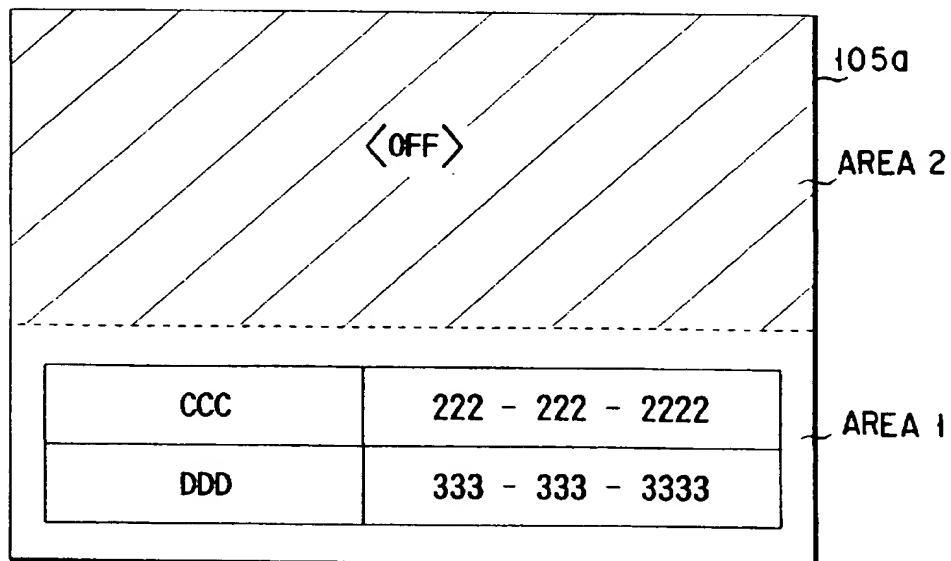


FIG. 13

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SELECTIVELY REMOVING POWER FROM MULTIPLE DISPLAY AREAS OF A DISPLAY UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information device having a display unit such as a liquid crystal display (LCD), etc., and particularly to an information device in which the display unit has a plurality of display areas and power consumption can be controlled by controlling the plurality of display areas.

2. Description of the Related Art

Generally, in a portable information device, the device having an LCD (liquid crystal display) is frequently used. Normally, in an information displaying method on the display unit, one system is provided with one LCD, and information is displayed on a screen of LCD when power is turned on. According to a conventional dot-matrix type LCD, one LCD unit has a pair of drivers for driving an electrode for a display in each of X- and Y-axis directions. At a power-on time, electric power is supplied to the driver for each of the axial directions, and the entire LCD screen is driven.

It is required that the handy type information device be used for a long period time by a battery driving. For this reason, displaying information by use of the display device is preferably restricted to the necessary minimum in order to reduce power consumption.

However, there is a case in which certain information must be always represented, depending on a function formed in the handy type information device. In this case, the entire display screen must be always driven to display information on the LCD display screen. For example, it is assumed that there is provided a function for notifying a residual amount of the battery in the information device. In this case, information for showing the residual amount of the battery must be always represented. Due to this, the LCD screen is always driven to display such information on the LCD display screen.

In this case, there can be considered the use of an LED (light-emitting diode). In general, however, electric power, which is necessary for driving the LED, is much larger than electric power, which is necessary for driving the LCD.

As mentioned above, in the conventional information device, the entire LCD display must be always driven to always display certain information on the screen. As a result, a large amount of power is consumed, and time for driving the information device using the battery is reduced.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an information device in which a plurality of display areas is formed in a display unit and these display areas are controlled in accordance with an amount of information to be displayed so as to reduce power consumption.

According to a first aspect of the present invention, there is provided an information device comprising: a display panel having a first display area and a second display area; first driver means for displaying information on said first display area; second driver means for displaying information on said second display area; a first controller for controlling said first driver means; a second controller for controlling said second driver means; a cover attached to said information device to be rotatable; a switch for detecting that said

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cover is overlaid on said display panel; and power supply means for supplying power to said first and second driver means and said first and second controllers, and said power supply means for stopping power supply to said first driver means and said first controller in accordance with the detection by said switch.

According to a second aspect of the present invention, there is provided an information device comprising: a display panel having a first display area and a second display area; first driver means for displaying information on said first display area; second driver means for displaying information on said second display area; a controller for controlling said first and second driver means; a cover attached to said information device to be rotatable; a switch for detecting that said cover is overlaid on said display panel; and power supply means for supplying power to said first and second driver means and said first and second controllers, and said power supply means for stopping power supply to said first driver means in accordance with the detection by said switch.

According to a third aspect of the present invention, there is provided an information device comprising: a display panel having a first display area and a second display area; a common driver for driving lines in a vertical-direction of said first and second display areas; a first driver for driving lines in a horizontal direction of said first display area; a second driver for driving lines in a horizontal direction of said second display area; a power supply for generating power to be output; a keyboard having a plurality of keys; detecting means for detecting a depression of a predetermined keys of said keyboard by an operator; a memory for storing display data; and a controller for supplying power to said common driver, and said first and second drivers, respectively, and for controlling said common driver, said first and second drivers in accordance with display data stored in said memory so as to be displayed, and for stopping power supply to said first driver in accordance with the detection of said detecting means.

According to the above information device, the display area on one display panel can be divided into a plurality of areas so as to selectively drive the respective areas as required. As a result, the display control can be carried out in accordance with an amount of information to be displayed, so that power consumption can be reduced.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently preferred embodiments of the invention and, together with the general description given above and the detailed description of the preferred embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a block diagram showing the structure of the information device according to a first embodiment of the present invention;

FIGS. 2A to 2C are views each explaining a display panel of FIG. 1;

FIG. 3 is an outline view of the information device of FIG. 1;

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FIG. 4 is a view showing one example of information displayed on the display panel of FIG. 1;

FIG. 5 is a view showing only a predetermined area of the display panel of FIG. 1;

FIGS. 6A and 6B are timing charts each showing a clock signal applied to the information device of FIG. 1;

FIG. 7 is a view showing the structure of the modification of the information device;

FIG. 8 is a block diagram showing the structure of the information device according to a second embodiment of the present invention;

FIG. 9 is an outline view of the information device of FIG. 8;

FIG. 10 is a flow chart showing a display control operation of the information device of FIG. 8;

FIGS. 11A and 11B are timing charts each showing a clock signal applied to the information device of FIG. 8;

FIG. 12 is a view showing one example of information displayed on the display panel of FIG. 8; and

FIG. 13 is a view showing only a predetermined area of the display panel of FIG. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will now be described with reference to the accompanying drawings.

A first embodiment, first, will be described.

FIG. 1 is a block diagram showing the structure of an information device of this embodiment. As shown in FIG. 1, the information device of this embodiment comprises a CPU 10, a ROM 12, LCD controllers 14a, 14b, VRAMs 16a, 16b, an LCD unit 18, a power supply controller 20, a power supply 22, a switch controller 24, a switch 26, and a PHS (personal handy phone system) functioning portion 28.

The CPU 10 executes a program in accordance with a program stored in the ROM 12 to control the entire information device.

The ROM 12 stores various kinds of data in addition to the program for defining the operation of the CPU 10. The program stored in the ROM 12 includes a SW program for controlling the LCD controllers 14 in accordance with a state of the switch 26 notified from the switch controller 24 and a power supply controller 20, and a program for controlling a data communication using the PHS functioning portion 28.

The LCD controllers 14a and 14b carry out a display control through the LCD 18 under the control of the CPU 10. The LCD controllers 14a and 14b drive drivers (to be described later) of the LCD unit 18 in accordance with display data stored in the VRAMs 16 so as to display information. The LCD controllers 14a and 14b turn on/off the drivers in accordance with notification from the CPU 10 so as to display only information of a specific area on the display screen. In the first embodiment, as shown in FIG. 1, two LCD controllers 14a and 14b are provided to carry out the display control of the two areas formed on the LCD unit 18a individually.

Also, crystal oscillators 15a and 15b are connected to the LCD controllers 14a and 14b, respectively. The crystal oscillators 15a and 15b generate clock signals having a different frequency to be supplied to the LCD controllers 14a and 14b, respectively. For example, the crystal oscillator 15a supplies the clock signal shown in FIG. 6B to the LCD controller 14a, and the crystal oscillator 15b supplies the clock signal shown in FIG. 6A to the LCD controller 14b.

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The VRAMs 16a and 16b are connected to the LCD controllers 14a and 14b, respectively. The VRAMs 16a and 16b store display data to be displayed to the LCD unit 18. The VRAMs 16a and 16b are controlled by the LCD controllers 14a and 14b, respectively.

The LCD unit 18 is controlled to receive power supply by the power supply controller so as to display information under control of the LCD controllers 14a and 14b. The LCD 18 comprises a display panel 18a, a Y-driver 18b for an area 1, an X-driver 18c for an area 1, a Y-driver 18d for an area 2, and an X-driver 18e for an area 2. The display panel 18a is divided into areas 1 and 2, which are independently driven by the corresponding drivers. Specifically, the area 1 is driven by the drivers 18b and 18c, and the second area 2 is driven by the drivers 18d and 18e. The Y-driver 18b and X-driver 18c are driven by the LCD controller 14a, and the Y-driver 18d and X-driver 18e are driven by the LCD controller 14b.

As mentioned above, two display areas 1 and 2 are formed on the display panel 18a, which is the single panel. In the first embodiment, an annunciator for showing intensity of electric field and an annunciator for showing a residual amount of the battery are displayed on the area 1.

The power supply controller 20 supplies electric power from the power supply 22 to the respective parts constituting the information device including the LCD unit 18. The power supply controller 20 has a function of detecting the amount of power (residual amount of battery) stored in the power supply 20. If a voltage is decreased to a predetermined value, the power supply controller 20 notifies the decrease in voltage to the CPU 10, and controls the power supply to the predetermined drivers of the LCD unit 18.

The power supply 22 is a battery for storing electric power to be supplied to the respective parts constituting the information device including the LCD unit 18.

The switch controller 24 detects the on/off state of the switch 26. If the switch 26 is changed, that is, it is unnecessary to display information on the area 2 of the display panel 18a, the switch controller 24 notifies the state to the CPU 10.

The switch 26 is used to detect the state in which the information display on the area 2 is not needed. In this embodiment, the switch 26 is changed when an LCD cover 32 for covering the area 2 is closed. The on/off state of the switch 26 is detected by the switch controller 24, and the state is notified to the CPU 10.

The PHS functioning portion 28 is used to carry out a radio communication based on the standard of PHS. The PHS functioning portion 28 notifies data, which is received and transmitted through the radio communication, and intensity of electric field between the information device and a base station to the CPU 10.

The following will explain information display on the areas 1 and 2 of the display panel 18a with reference to FIGS. 2A to 2C.

As shown in FIG. 2A, the area 2 of the display panel 18a is formed of 160 pixels in a vertical direction and 239 pixels in a horizontal direction. The Y-driver 18d controls 160 lines in the horizontal direction, and the X-driver 18e controls 239 lines in the vertical direction. The area 1 of the display panel 18a is formed of one pixel in a vertical direction and 8 pixels in a horizontal direction. In order to perform display controlling of one pixel, the Y-driver 18b controls 8 lines in a horizontal line, and the X-driver 18c controls one line in the vertical direction. In this case, the respective pixels of the area 2 have the same size. Then, a predetermined shape is allocated to the respective pixels of the area 1.

Predetermined shapes as shown in FIGS. 2B and 2C are allocated to the respective pixels 18-1 to 18-8 of the area 2. The shapes of the pixels 18-1 to 18-4 shown in FIG. 2B are provided to display the annunciator showing density of electric field. The shapes of the pixels 18-5 to 18-8 shown in FIG. 2C are provided to display the annunciator showing the residual amount of the battery.

An example of the outline of the information device to which the above-mentioned structure is applied will be described as follows.

FIG. 3 shows the outline of the information device to which the above-mentioned structure is applied. In the display device, there is provided an antenna 29 for realizing the PHS function. The antenna 29 is provided to be containable in the main body of the device. A display cover 30 is attached to the device to be rotatable by a hinge mechanism (not shown). The display cover 30 can rotate to overlay on the display panel 18a. At this time, the area 2 is covered with the display cover 30, and only the area 1 can be seen from the outer section. Or, the switch 26 is turned on when the cover 30 is overlaid on the display panel 18a. In the information device, a key set 31 for inputting an operator's instruction. However, the information device may be structured such that a manual input can be carried out with a predetermined pen.

An operation of the information device of this embodiment will be explained as follows.

In the information device of this embodiment, there are provided the function of displaying the intensity of electric field between the information device and the base station, and a function of displaying the residual amount of the battery stored in the power supply 22.

As shown in FIG. 4, the intensity of electric field and the residual amount of the battery are displayed on the area 1 formed on the panel 18a of the LCD unit 18. The CPU 10 outputs display data showing the residual of the battery through the LCD controller 14a in accordance with data notified from the power supply controller 20 to show the voltage value of the power supply 22 detected by the battery residual detecting function. The display data is stored in the VRAM 16a. Then, the display data is displayed on the display panel 18a. The CPU 10 outputs displayed data showing the density of the electric field through the LCD controller 14a in accordance with data notified from the PHS functioning portion 28 to show the density of electric field between the information device and the base station. The display data is stored in the VRAM 16a. Then, the display data is displayed on the display panel 18a.

The LCD controllers 14a and 14b control the drivers 18b, 18c and the drivers 18d, 18e so that the respective areas 1 and 2 of the display panel 18a are driven in accordance with the notification from the CPU 10. Since it is needed that the area 1 be always displayed (or standby state for PHS functioning portion 28), the LCD controller 14a drives the Y-driver 18b and the X-driver 18c in accordance with display data stored in the VRAM 16a (display data showing the residual of the battery, display data showing density of electric field).

For executing the general function of the information device, the LCD controller 14b drives the Y-driver 18d and the X-driver 18e to display information on the area 2. For example, as shown in FIG. 4, the LCD controller 14b drives the Y-driver 18d and the X-driver 18e to display a telephone book on the area 2.

The power supply controller 20 supplies power to the respective drivers, which are controlled by the LCD controllers 14a and 14b, and the LCD controllers 14a and 14b.

In a case where the general function of the information device is not used, the following operation can be executed.

Specifically, the LCD cover 30, which is attached to the main body of the device is closed to cover the display screen of the display panel 18a. The LCD cover 32 is attached to the main body of the device to be freely rotated from a close state to an open state. The close state corresponds to a position facing in parallel to the display panel 18a formed on an upper surface of the main body of the device. In this case, the end portion of the upper surface of the main body is set as a fulcrum. The open state corresponds to a position having a predetermined angle with a surface of the display panel 18a.

If the LCD cover 30 is placed at the position facing in parallel to the display panel 18, that is, the cover 30 is closed to cover the display screen of the display panel 18, only the area 2, which is a part of the panel 18a, is covered. In this state, the LCD cover 30 changes the state of the switch 26 provided on the upper surface of the main body of the device. The switch controller 24 detects that the switch 26 is changed and notifies the state of the switch 26 to the CPU 10.

The CPU 10 stops displaying information on the area 2 in accordance with the notification from the switch controller 24. In other words, the drive of each of the Y- and X-drivers 18d and 18e is stopped. Also, the CPU 10 designates the power supply controller 20 to stop the power supply to the Y- and X-drivers 18d and 18e, and the LCD controller 14b. An example of the display on the display panel 18a in this case is shown in FIG. 5.

Specifically, when the unnecessary of displaying information on the area 2 is detected, only the area 1, which is necessary to be displayed, is continued to be displayed, the display on the area 2 is stopped. As a result, power consumption can be reduced. A high-voltage, for example, 20V or 40V, serving as a power supply for liquid crystal driving, is supplied to the respective drivers. Then, for example, 3.3V or 5.0V, serving as a logic power supply, is supplied to the LCD controllers. In the first embodiment, the power supply to the LCD controller 14b, Y- and X-drivers 18d, and 18e is stopped, so that power consumption can be largely reduced.

Moreover, the display drive of the area 2 is changed together with the open/close operation of the LCD cover 30, so that operability can be improved.

In the above explanation, the display change is intentionally carried out by, for example, closing the LCD cover 30 when there is no need of displaying information on the area 2, e.g., at the time when the PHS functioning portion 28 is set to a standby state for a radio communication and the function of the general information device is not used. It is, however, possible to automatically carry out the display change in accordance with the residual amount of the battery of the power supply 22.

The power supply controller 20 detects the residual amount of the battery of the power supply 22 by comparing the residual amount of the battery with a predetermined voltage value with use of the battery residual detecting function. When the power supply controller 20 detects that the voltage value is decreased to the predetermined voltage value, the result is notified to the CPU 10.

In this case, the predetermined voltage value means the residual amount of the battery with which can drive not the entire surfaces of the areas 1 and 2 but a part of the display area. Or, the predetermined voltage value means the residual amount of the battery with which can execute the function for a short period of time.

The CPU 10 normally ends the current executing function (program) in accordance with the SW program stored in the ROM 12. Also, the CPU 10 stops the display drive of the area 2 through the LCD controller 14b in accordance with the notification from the power supply controller 20. The power supply controller 20 stops the power supply to each of the Y- and X-drivers 18d and 18e through the LCD controller 14b.

Thus, information display on the area 1 can be continued to some extent.

In the above-mentioned embodiment, the LCD unit 18 was used as a display device in the information device. However, the same display driving method can be used even in the information device using the other display unit.

Moreover, in the above embodiment explained that the state of the LCD cover 30 was changed by closing the LCD cover 30. However, the state of the switch 26 may be changed by any means, e.g., a manual method. Also, the display drive of the area 2 may be changed through the LCD controllers 14 by the programs executed by not the mechanical switch but the CPU 10.

In the above-mentioned embodiment, the area 1 was used as an area for information to be always displayed (intensity of electric field, residual amount of the battery). However, the entire surface of the display panel 18a including the areas 1 and 2 may be used as a display for executing the function of the information device, and specific information may be displayed on only the area 1 as required.

Moreover, the above embodiment explained that the display panel 18a was divided into two areas 1 and 2, so that the display of the area 2 was selectively stopped. However, the number of the areas is not limited to two. Three or more areas may be formed, and the X- and Y-drivers corresponding to the respective areas may be formed. Then, the display control and the power supply control of each area can be carried out.

In the above-mentioned embodiment, the LCD cover 30 was shaped to cover only the area 2. However, the LCD cover 30 may be shaped to cover the entire surface of the panel 18a so that only a part corresponding to the area 1 is transmitted through the display area so as to be visually conformed.

Moreover, in the above-mentioned embodiment, information displayed on the area 1 is not, of course, limited.

The following will explain a modification of the first embodiment with reference to FIG. 7.

The information device shown in FIG. 7 is structured to have one LCD controller is used in place of two LCD controllers of FIG. 1. In FIG. 7, the same reference numerals as the case of the first embodiment are added to the portions common to the first embodiment.

A crystal oscillator 15c and a VRAM 16c are connected to an LCD controller 14c. The LCD controller 14c has a counter 141 built-in. The LCD controller 14c counts the clock signal having a predetermined frequency, which is supplied from the crystal oscillator 15c, thereby generating the clock signals shown in FIGS. 6A and 6B. The drivers 18b and 18c, and the drivers 18d and 18e are individually controlled in accordance with the generated different clock signals. The clock signals shown in FIGS. 6A and 6B indicate timing to control the LCD drivers 18b, 18c, 18d and 18e for convenience of explanation. The waveforms of the clock signals shown in FIGS. 6A and 6B differ from actual waveforms.

In this modification, when the cover 30 is closed, the power supply to the drivers 18b and 18c are stopped from

the power supply controller 24. As a result, the power supply for the liquid crystal drive can be saved.

As mentioned above, according to the present invention, the display area is divided into the plurality of areas on the same display panel, so as to selectively display each area as required. As a result, the display can be controlled in accordance with the amount of information to be displayed, thereby making it possible to reduce the power consumption.

Next, the following will explain a second embodiment of the present invention with reference to the drawings.

The structure of the LCD control of the information device of the second embodiment is shown in FIG. 8, and the outline is shown in FIG. 9. The information device shown in FIGS. 8 and 9 is a small-sized portable computer having a size and a weight enough to be mounted on the palm of the operator's hand.

A CPU 100 is connected to the various kinds of structural elements of the information device to control the entire information device. The CPU 100 is connected to the an LCD controller 101, a VRAM 102, a keyboard controller (KBC) 103, a ROM 104, and the other structural elements such as a system memory.

The LCD controller 101 is connected to the VRAM 102, segment drivers 105b, 105c, and 105d. The LCD controller 101 controls various kinds of processing for display data and the drive of each of the drivers 105b to 105d in order to display information of on a display panel 105a of an LCD unit 105. The LCD controller 101 has a switch portion 101a, and a clock generator 101b built-in. The clock generator 101b generates a clock signal having a predetermined frequency to be supplied to the switch 101a. The switch 101a changes the received clock signal by a predetermined timing so as to generate a clock signal shown in FIGS. 11A and 11B.

The LCD controller 101 controls the driver 105c by the timing of the clock signal shown in FIG. 11A. Also, the LCD controller 101 controls the driver 105d by the timing of the clock signal shown in FIG. 11B. It is noted that the LCD controller 101 controls the driver 105b by the timing of the clock signal, which is not yet changed by the switch 101a, that is, the timing of the clock signal generated by the clock generator 101b.

The LCD controller 101 is connected to a power supply (battery) 106. The LCD controller 101 inputs power for driving from the power supply 106. The LCD controller also inputs power for drivers 105b to 105d, the so-called driving power for liquid crystal so as to be supplied to the drivers 105b to 105d. The LCD controller 101 turns on/off the power supply for liquid crystal under the control of the CPU 100. For example, the power supply to the drivers 105c and 105d is individually controlled in accordance with the control of the LCD controller 101. As a result, the LCD controller 101 drives both the drivers 105c and 105d so as to display information on the two areas 1 and 2 as shown in FIGS. 8 and 9. Or, the LCD controller 101 drives only the driver 105c or 105d so as to display information on only the area 1 or 2. In the second embodiment, the information device is structured such that only the area 1 can be separately displayed. Then, for displaying information on only the area 1, the power supply to the driver 105c is stopped.

The VRAM 102 stores display data of information to be displayed on the display panel 105a. The VRAM 102 has a storage area 102a for an area 1 and a storage area 102b for an area 2.

The KBC 103 is connected to a keyboard 107. The KBC 103 inputs an operator's instruction due to the depression of

the key of the keyboard 107, and notifies the instruction to the CPU 100. If the KBC 103 detects that an Fn key and any one of function key are simultaneously depressed, the KBC 103 recognizes the detected result as a depression of a hot-key to be notified to the CPU 100. The CPU 100 controls the LCD controller 101 to display only the area 1 in accordance with the depression of the hot-key.

It is noted that the information device of this embodiment has a pointing device 101 (FIG. 9) in addition to the keyboard as an device for inputting the operator's instruction.

The ROM 104 stores a program, which is necessary to the operation of the CPU 100. A memory (MEM) 109 stores various kinds of programs, which are necessary for the operation of the information device, and data. In the second embodiment, in the case of displaying only the area 1, the memory 109 stores data whether or not data instructing from the operator is designated in advance. If such data is designated, the memory 109 stores designating data showing which information is displayed.

Next, the following will explain an operation of the display control of the information device of the second embodiment with reference to FIGS. 10, 12, and 13.

When power is supplied to the information device in the normal use, the LCD controller 101 supplies power to the drivers b to d so as to display, e.g., a telephone book, on the areas 1 and 2 of the display panel 105a. In this case, if the Fn key and a predetermined function key is depressed, the KBC 103 notifies the depression of the hot-key to the CPU 100. The CPU 100 reads designation data of the memory 109 in accordance with the notification of the depression of the hot-key.

If designation data shows that no display information onto the area 1 is designated (step S1, NO), the CPU 100 designates the LCD 101 to stop the power supply to the drivers b to d. As a result, the areas 1 and 2, that is, the display processing of the entire surface of the display panel 105 is stopped (step S2). In this case, the power supply of the entire information device is not turned off. In other words, only the power supply to the LCD unit 105 is stopped.

If the read designation data shows that names CCC and DDD, and telephone numbers of CCC and DDD are to be displayed on the area 1 as shown in FIG. 12 (step S1, YES), the CPU 100 executes a rewriting processing of display data stored in the VRAM 102 (step S3). In the rewriting processing, the CPU 100 writes data of the names CCC and DDD, and the telephone numbers of CCC and DDD, that is, display data, which corresponds to information enclosed by a thick line of FIG. 12, to the storage area 102a.

Thereafter, the LCD controller 101 displays information on the display panel 105a in accordance with display data stored in the VRAM 102, and stops the power supply to the drivers 105c (steps S4 and S5). Thereby, information as shown in FIG. 13 is displayed on the area 1, and no information is displayed on the area 2.

As mentioned above, according to the second embodiment, two display areas are formed on one display panel. Then, only necessary information is displayed on a predetermined area in accordance with the operation of the hot-key by the operator. As a result, power, which is necessary to display information on the other area, can be saved. Thus, the second embodiment can obtain the same advantage as the case of the first embodiment.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, and

representative devices shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

1. An information device comprising:

a display panel having a first display area and a second display area for separately displaying information different from each other;

a cover for covering at least part of said display panel, in which an operator is capable of viewing said first display area and not capable of viewing said second display area when said cover is overlaid on said display panel; and

means for controlling such that information is not displayed on said second display area by stopping power to said second display area and information is displayed on said first display area when said cover is overlaid on said display panel.

2. An information device according to claim 1, further comprising a battery, said controlling means stopping power supplied from said battery to said second display area.

3. An information device according to claim 1, further comprising means for carrying out a radio communication, said first display area for displaying information regarding said radio communication.

4. An information device according to claim 3, wherein said first display area displays information indicative of an intensity of an electric field between said information device and a base station using said means for carrying out a radio communication.

5. An information device according to claim 2, wherein said first display further displays information indicating an amount of charge remaining in said battery.

6. An information device according to claim 2, further comprising means for stopping power supplied to said second display area in accordance with an amount of charge remaining in said battery.

7. An information device according to claim 1, further comprising a switch for detecting that said cover is overlaid on said display panel, said controlling means stopping the displaying on said second display area in response to said switch.

8. An information device according to claim 1, further comprising driver means, controlled by said controller means, for displaying information on said second display area, wherein power supplied to said driver means and said controller means is stopped when said cover is overlaid on said display panel.

9. An information device comprising:

a display panel having a first display area and a second display area for separately displaying information different from each other;

means for carrying out a radio communication, said first display area for displaying information indicative of an intensity of an electric field between said information device and a base station using said means for carrying out a radio communication;

a cover for covering at least part of said display panel, such that an operator is capable of viewing said first display area and not capable of viewing said second display area when said cover is overlaid on said display panel; and

means for controlling such that information is not displayed on said second display area by stopping power

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to said second display area and the information indicative of the intensity of the electric field is displayed on said first display area when said cover is overlaid on said display panel.

10. An information device according to claim 9, wherein the intensity of the electric field is represented on said first display area by an annunciator including a plurality of pixels each having a predetermined shape.

11. An information device according to claim 9, wherein said first display area further displays information indicating an amount of charge remaining in a battery provided in said information device.

12. An information device comprising:

a display panel having a first display area and a second display area for separately displaying information different from each other; a cover for covering at least part of said display panel, in which an operator is capable of viewing said first display area and not capable of viewing said second display area when said cover is overlaid on said display panel;

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means for specifying by an operator in advance, part of the information displayed on said first and second display areas; and

means, responsive to an instruction by an operator, for controlling such that information is not displayed on said second display area by stopping power to said second display area and causing said first display area to display the information specified by the operator.

13. An information device according to claim 12, further comprising means for carrying out a radio communication, said first display area displaying information regarding said radio communication.

14. An information device according to claim 12, wherein said first display area displays information indicative of an intensity of an electric field between said information device and a base station.

15. An information device according to claim 12, wherein said first display area displays information indicating an amount of charge remaining in a battery provided in said information device.

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